

Culture-specific tonal knowledge drives judgments about an unfamiliar tonality: A probe-tone study

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INTRODUCTION

- Knowledge of a tonal system can drive a listener's expectations for future musical events

- The rules of a tonal system are learned implicitly and effortlessly by listeners who have had adequate exposure to the tonal system

- Most of the research that has examined tonal expectations has been conducted on Western subjects listening to Western tonal music

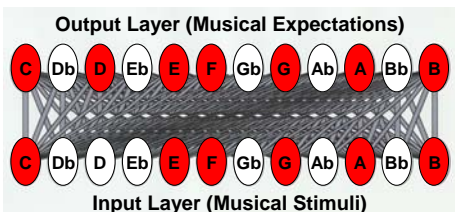
- We examined whether the tonal rules of Western music are used to generate musical expectations when listening to music of an unfamiliar tonal system

- We compared the musical expectations of Western subjects when they were listening to Western tonal melodies to their expectations when they were listening to Indian tonal melodies

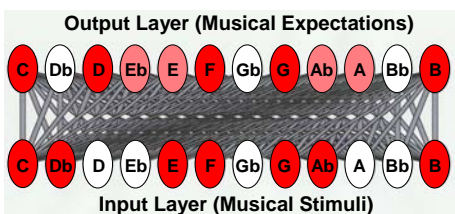
NEURAL NET PREDICTIONS

- An auto-associative neural network was used to model the expectations of a Western listener

- The model was trained on the Western major scale (C, D, E, F, G, A, B) and the harmonic minor scale (C, D, Eb, F, G, Ab, B)



- When the input layer is presented with an incomplete major scale, the output layer completes the scale, indicating that it has learned to associate the missing note with those presented as stimuli



- When the input layer is presented with a culturally-unfamiliar scale, such as the rag Bhairav, the output layer distributes activation to notes of the major and minor scales, ignoring the culturally-incongruous input

EXPERIMENT

192 trials, each consisting of:

- Short melody (7 notes, 250 ms each)
- 1000 ms of silence
- 1000 ms memory probe tone

Task:

- Decide whether or not the probe tone was played in the melody

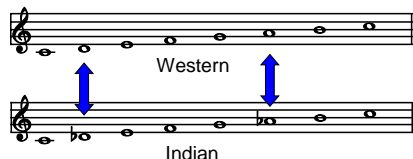
Subjects:

- 21 college students
- All were unfamiliar with Indian music
- All were familiar with Western music
- Some had formal training in Western music

STIMULI

- 24 short melodies composed from the notes of the Western C major scale (C, D, E, F, G, A, B)

- 24 short melodies composed from the notes of the Indian rag Bhairav (C, Db, E, F, G, Ab, B)



- The 2nd and 6th scale degrees differ between the two scales, but all the other notes are the same

- In each melody, either the 2nd or 6th scale degree was omitted

Example melodies

Western: C, G, A, B, F, E, C

C, G, D, B, F, E, C

Indian: C, G, Ab, B, F, E, C

C, G, Db, B, F, E, C

- Each melody was played 4 times during the experiment, followed once by each of the 4 memory probe tones: Db, D, Ab, A

Is the memory probe tonally congruous with the pitch set, according to the *culture-specific tonal rules* of each pitch set?

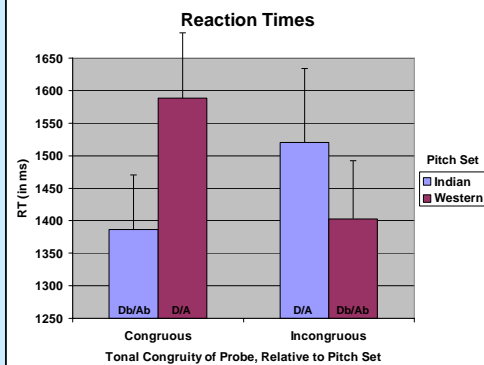
	Db	D	Ab	A
Western Pitch Set	No	Yes	No	Yes
Indian Pitch Set	Yes	No	Yes	No

Is the probe tonally congruous with the pitch set, according to a *Western tonal framework*?

	Db	D	Ab	A
Western Pitch Set	No	Yes	No	Yes
Indian Pitch Set	No	Yes	No	Yes

We predict that subjects will judge all probes according to a Western tonal framework.

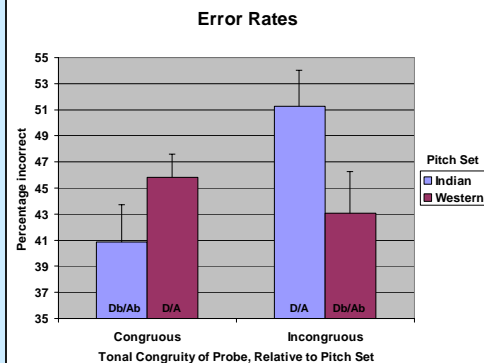
RESULTS



- There were no significant main effects

- There was a significant interaction between pitch set culture and tonal congruity of the probe [$F(1,20)=21.745, p<.001$]

- Participants were slower to correctly reject the D and A probes than the Db and Ab probes, regardless of the culture of the melodic pitch set



- There was a main effect of probe congruity [$F(1,20)=6.273, p=.021$]

- Error rates were higher when the probes were tonally incongruous with the melodic pitch set

- There was an interaction between pitch set culture and probe congruity [$F(1,20)=5.448, p=.03$]

- Participants made more errors when judging D and A probes than when judging Db and Ab, regardless of the culture of the melodic pitch set

CONCLUSIONS

The results suggest that Western listeners use a Western tonal framework to guide their musical expectations when listening to music from an unfamiliar tonality.

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